

CLAIMS

What is claimed is:

1. A composite medium, comprising:
at least one trialkyl methylammonium compound homogenously dispersed in a polyacrylonitrile matrix.
2. The composite medium of claim 1, wherein the at least one trialkyl methylammonium compound comprises at least one of trialkyl methylammonium nitrate or trialkyl methylammonium chloride.
3. The composite medium of claim 1, wherein the at least one trialkyl methylammonium compound is present from approximately 5% by weight to approximately 30% by weight.
4. The composite medium of claim 1, wherein the polyacrylonitrile of the matrix is present from approximately 70% by weight to approximately 95% by weight.
5. The composite medium of claim 1, wherein the at least one trialkyl methylammonium compound homogenously dispersed in the polyacrylonitrile matrix comprises homogenous, substantially spherical particles.
6. The composite medium of claim 1, further comprising a substrate at least partially impregnated with the at least one trialkyl methylammonium compound homogenously dispersed in the polyacrylonitrile matrix.
7. The composite medium of claim 6, wherein the substrate comprises glass fiber, paper, or polytetrafluoroethylene.

8. A method of forming a composite medium, comprising:
dissolving polyacrylonitrile in a solvent to form a matrix solution;
combining at least one trialkyl methylammonium compound with the matrix solution to form a
homogenous, composite medium solution;
diluting the solvent; and
solidifying the homogenous, composite medium solution.

9. The method of claim 8, wherein dissolving polyacrylonitrile in a solvent to form a matrix solution comprises dissolving from approximately 2% by weight to approximately 5% by weight polyacrylonitrile in the solvent.

10. The method of claim 8, wherein combining at least one trialkyl methylammonium compound with the matrix solution to form a homogenous, composite medium solution comprises combining at least one of trialkyl methylammonium nitrate or trialkyl methylammonium chloride in the matrix solution.

11. The method of claim 8, wherein combining at least one trialkyl methylammonium compound with the matrix solution to form a homogenous, composite medium solution comprises combining from approximately 5% by weight to approximately 30% by weight of the trialkyl methylammonium compound in the matrix solution.

12. The method of claim 8, wherein diluting the solvent comprises depositing portions of the composite medium solution into a water bath.

13. The method of claim 12, wherein solidifying the homogenous, composite medium solution comprises forming homogenous, substantially spherical beads from the portions of the composite medium solution.

14. The method of claim 8, further comprising impregnating the homogenous, composite medium solution into a substrate.

15. The method of claim 14, wherein impregnating the homogenous, composite medium solution into a substrate comprises impregnating the homogenous, composite medium solution into a glass fiber, paper, or polytetrafluoroethylene substrate.

16. The method of claim 14, wherein diluting the solvent comprises depositing the substrate into a water bath.

17. The method of claim 8, wherein solidifying the homogenous composite medium solution comprises entrapping the at least one at least one trialkyl methylammonium compound in the polyacrylonitrile.

18. A method of removing a constituent from a fluid stream, comprising:
providing a composite medium comprising at least one trialkyl methylammonium compound homogeneously dispersed in a polyacrylonitrile matrix;
passing the fluid stream comprising the constituent through the composite medium; and
removing the constituent from the fluid stream.

19. The method of claim 18, wherein providing a composite medium comprising at least one trialkyl methylammonium compound homogeneously dispersed in a polyacrylonitrile matrix comprises providing at least one of trialkyl methylammonium nitrate or trialkyl methylammonium chloride homogeneously dispersed in the polyacrylonitrile matrix.

20. The method of claim 18, wherein providing a composite medium comprising at least one trialkyl methylammonium compound homogeneously dispersed in a polyacrylonitrile matrix comprises providing the at least one trialkyl methylammonium compound from approximately 5% by weight to approximately 30% by weight.

21. The method of claim 18, wherein providing a composite medium comprising at least one trialkyl methylammonium compound homogenously dispersed in a polyacrylonitrile matrix comprises homogenously dispersing the at least one trialkyl methylammonium compound in from approximately 70% by weight to approximately 95% by weight polyacrylonitrile.

22. The method of claim 18, wherein passing the fluid stream comprising the constituent through the composite medium comprises passing the fluid stream comprising plutonium and americium through the composite medium.

23. The method of claim 18, wherein removing the constituent from the fluid stream comprises selectively removing the plutonium over the americium from the fluid stream.

24. The method of claim 18, wherein passing the fluid stream comprising the constituent through the composite medium comprises passing the fluid stream comprising technetium through the composite medium.

25. The method of claim 18, wherein removing the constituent from the fluid stream comprises removing the technetium from the fluid stream.